

CLAIMS

1. A socket device for receiving a connection pin or solder ball, said socket device comprising:

5 a substrate having an upper surface;

a connection pad disposed on said upper surface;

a layer disposed on said upper surface and on said connection pad, said layer including material having an overall negative coefficient of thermal expansion;

10 a contact hole formed in said layer exposing a portion of said connection pad.

2. A socket device for receiving a connection pin or solder ball, said socket device comprising:

a substrate having an upper surface;

15 a connection pad disposed on said upper surface;

a first layer disposed on said upper surface and on said connection pad, said first layer including material having an overall positive coefficient of thermal expansion;

20 a second layer disposed on said first layer, said second layer including material having an overall negative coefficient of thermal expansion; and

a contact hole formed in said first and second layers exposing a portion of said connection pad.

3. The socket device of claim 2, including a bonding layer disposed between said first and second layers, said bonding layer bonding said first and second layers together.

5 4. The socket device of claim 2, wherein said contact hole includes a first portion formed in said first layer having a first linear dimension and a second portion formed in said second layer having a second linear dimension smaller than said first linear dimension.

10 5. The socket device of claim 1, wherein said layer includes zirconium tungstate.

6. The socket device of claim 2, wherein said second layer includes zirconium tungstate.

15 7. The socket device of claim 5, wherein said layer including zirconium tungstate has a substantially isotropic negative thermal expansion behavior.

8. The socket device of claim 6, wherein said second layer including zirconium tungstate has a substantially isotropic negative thermal expansion behavior.

20 9. The socket device of claim 7 or 8, wherein said substantially isotropic negative thermal expansion behavior is exhibited at least in a temperature range of from about 100 °C to about 200 °C.

10. The socket device of claim 9, wherein said substantially isotropic negative thermal expansion behavior is exhibited at least at a temperature of about 150 °C.

5 11. The socket device of claim 1, wherein said contact hole includes a chamfer formed in said layer.

12. The socket device of claim 2, wherein said contact hole includes a chamfer formed in said second layer.

10 13. The socket device of claim 3, wherein said contact hole includes a first portion formed in said first layer having a first linear dimension and a second portion formed in said second layer having a second linear dimension smaller than said first linear dimension.

15 14. The socket device of claim 3, wherein said second layer includes zirconium tungstate.

20 15. The socket device of claim 14, wherein said second layer including zirconium tungstate has a substantially isotropic negative thermal expansion behavior.

16. The socket device of claim 15, wherein said substantially isotropic negative thermal expansion behavior is exhibited at least in a temperature range of from about 100 °C to about 200 °C.

5 17. The socket device of claim 16, wherein said substantially isotropic negative thermal expansion behavior is exhibited at least at a temperature of about 150 °C.

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